

Keys to Selected Native and Cultivated Woody Plants  
of Madison, Wisconsin



by  
Dr. Robert R. Kowal  
Department of Botany  
University of Wisconsin-Madison

Fall, 1972  
revised Fall, 1973  
nomenclature revised Summer, 1984

# Leaf Arrangement



Opposite



Alternate



Whorled



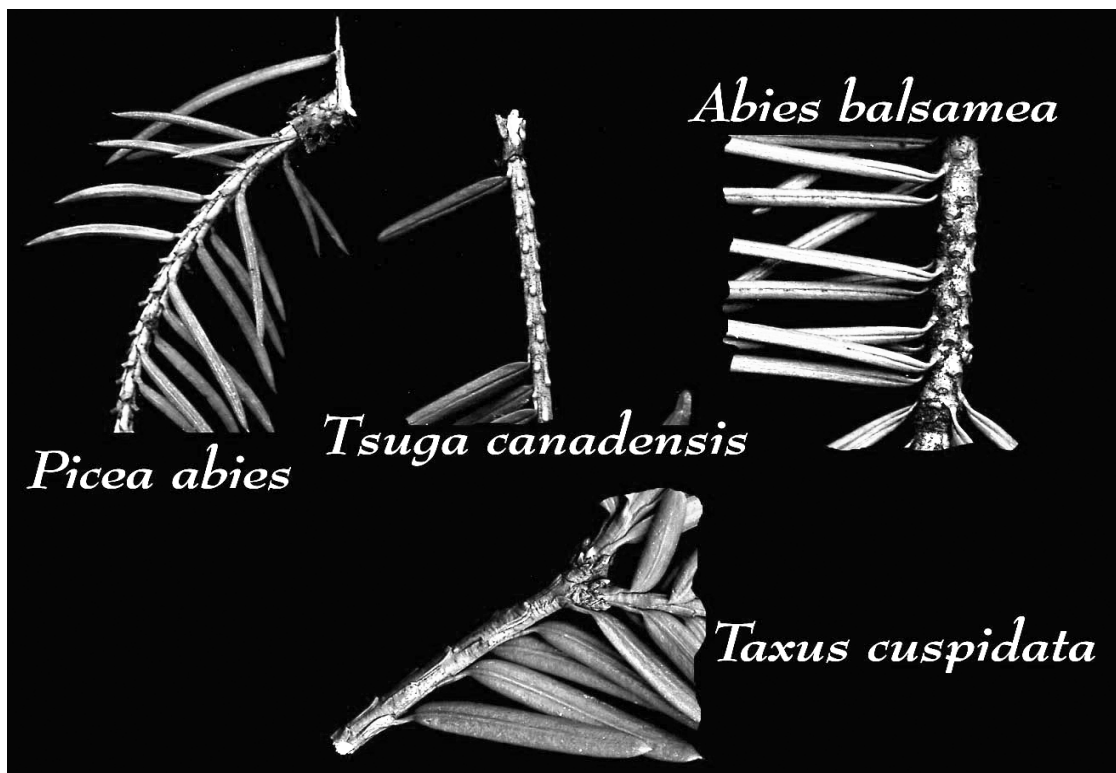
## **Key I. Identification of Major Groups.**

1. Leaves, needles or scales narrower than 1 cm, with 1 or 2 veins **Key II**  
(Page 2)
1. Leaves broad and flat, wider than 1 cm, with numerous veins
  2. Trees
    3. Leaves opposite or whorled **Key III**  
(Page 4)
    3. Leaves alternate (sometimes apparently whorled on short stubby shoots)
      4. Leaves simple **Key IV**  
(Page 6)
      4. Leaves compound **Key V**  
(Page 10)
  2. Shrubs or vines
    5. Leaves opposite or whorled **Key VI**  
(Page 12)
    5. Leaves alternate (sometimes apparently whorled on short stubby shoots)
      6. Leaves simple **Key VII**  
(Page 15)
      6. Leaves compound **Key VIII**  
(Page 17)

**Key II.** Plants with needle-like or scale-like leaves with 1 or 2 veins. Conifers.

1. Leaves in clusters of 2-5 on short shoots, usually sheathed with scales at base..... **Pines**  
(*Pinus*)
1. Leaves alternate, opposite, or whorled
  2. Leaves opposite or whorled with 2 or 3 leaves per node
    3. Lateral branches usually deciduous, deciduous tree; leaves opposite, mostly longer than 1.5 cm; leaves flat and flexible..... **Dawn redwood**  
(*Metasequoia glyptostroboides*)
    3. Lateral branches persistent; evergreen trees and shrubs; leaves in whorls of 3 or, if opposite, shorter than 1.5 cm; leaves scale-like or awl-shaped, rigid
      4. Branchlets branching in one plane, forming flattened sprays; cones woody, dehiscent..... **American arborvitae**  
(*Thuja occidentalis*)
      4. Branchlets forming 3-dimensional sprays; cones berry-like, indehiscent..... **Junipers**  
(*Juniperus*)
  2. Leaves alternate (sometimes apparently whorled on spur shoots)
    5. Deciduous trees; leaves thin and flexible  
..... **Larch**  
(*Larix*)
    5. Evergreen trees and shrubs; leaves thick and rigid
      7. Leaves on current year's twigs usually 4-sided, less than 1.2 mm wide, sharp-pointed, if flattened, then stomata (forming lighter bands on leaf surface) only on upper side; leaves evenly distributed on upper side of twig; older branches roughened by persistent leaf bases..... **Spruces**  
(*Picea*)
      7. Leaves flattened, with distinct upper and lower surfaces, usually more than 1.2 mm wide, blunt to sharp-pointed; stomata only on lower side of leaf; leaves tending to spread in one plane

8. Current year's twigs sheathed by green decurrent leaf bases - dioecious shrubs, hardy outdoors; fruit an axillary seed sheathed by a red, fleshy cup.....**Yews**  
(*Taxus*)
8. Twigs brown, leaves not conspicuously decurrent
9. Twigs glabrous; buds glazed with resin; cones erect with deciduous scales.....**Fir**  
(*Abies*)
9. Twigs minutely pubescent; buds not resinous; cones pendulous with persistent scales
10. Leaves shorter than 1.5 cm; cones shorter than 2.5 cm with bracts much shorter than scales.....**Hemlock**  
(*Tsuga canadensis*)
10. Leaves longer than 1.5 cm; cones longer than 5 cm with bracts much longer than scales.....**Douglas fir**  
(*Pseudotsuga menziesii*)



**Key III. Trees with Opposite or Whorled Leaves.**

**1. Leaves simple**

2. Leaves heart shaped, pinnately veined.....**Catalpa**  
(*Catalpa speciosa*)

2. Leaves lobed, palmately veined

3. Leaves with 20 or more points on each side

4. Leaves 5-7 lobed

5. Sinus between lobes U-shaped, extending at least half way to base of leaf blade; leaves strongly whitened beneath .....**Silver maple**  
(*Acer saccharinum*)

5. Sinus between lobes V-shaped, extending less than half way to base of leaf blade; leaves lighter beneath but not strongly whitened.....**Red maple**  
(*Acer rubrum*)

4. Leaves 3 lobed.....**Siberian maple**  
(*Acer ginnala*)

3. Leaf with not more than 12 points on each side

6. Juice of petiole milky; blade with 7 main veins; buds stout and blunt.....**Norway maple**  
(*Acer platanoides*)

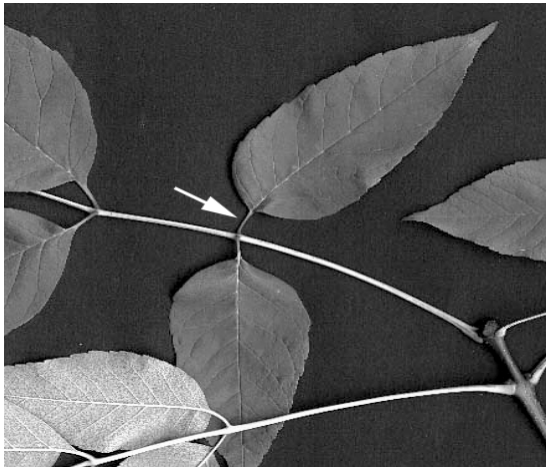
6. Juice of petiole not milky; blade with 3-5 main veins; buds slender and sharp-pointed.....**Sugar maple**  
(*Acer saccharum*)

**1. Leaves compound**

7. Leaves pinnately compound

8 Leaflets 3-5.....**Box elder**  
(*Acer negundo*)

- 8. Leaflets 7-11, sometimes 5
  - 9. Leaflets with long, obvious, petiolules.....**White ash**  
(*Fraxinus americana*)
  - 9. Leaflets without long, obvious, petiolules  
.....**Green/Red Ash**  
(*Fraxinus pennsylvanica*)
- 7. Leaves palmately compound  
.....**Ohio buckeye**  
(*Aesculus glabra*)



White Ash



Green Ash

**Key IV. Trees with alternate, simple leaves.**

1. Leaves broadly fan-shaped, rounded or notched at tip, with dichotomous venation; spurs (short, stubby branches bearing a cluster of leaves) present; fruit a naked, stinking fleshy-coated seed; gymnosperm.....**Ginkgo**  
(*Ginkgo biloba*)
  
1. Leaves not fan-shaped, acute at tip, with net-venation; seeds enclosed in an ovary; angiosperms
  2. Some or all leaves lobed
    3. Leaves pinnately veined with 1 main vein at base; fruit an acorn
      4. Lobes of leaves not bristle-tipped
        5. Cup of acorn fringed with coarse bristles; upper lobe of leaves much larger than the others.....**Bur oak**  
(*Quercus macrocarpa*)
        5. Cup of acorn not fringed; lobes about equal in size.....**White oak**  
(*Quercus alba*)
      4. Lobes of leaves tipped by a distinct bristle
        - 6 Sinuses between lobes extending up to halfway to midrib; buds glabrate.....**Red oak**  
(*Quercus borealis = Q. rubra*)
        6. Sinuses between lobes extending more than halfway to midrib; buds densely covered with white hairs.....**Black oak**  
(*Quercus velutina*)
    3. Leaves palmately veined with 3 main veins from base, many not symmetrical, mitten-shaped; small trees with leaves smaller than oaks; fruit fleshy.....**Mulberry**  
(*Morus alba*)
  
  2. Leaves without lobes
    7. Leaf margin entire.....**Alternate-leaved dogwood**  
(*Cornus alternifolia*)



7. Leaf margin toothed

8. Leaves once toothed

9. Leaf blades mostly over 3 times as long as broad

10. Buds with more than one bud scale; older leaves usually with rusty hairs on the lower surface along both sides of the midrib .....**Wild black cherry**  
(*Prunus serotina*)

10. Buds with one bud scale; leaves without rusty hairs beneath base .....**Willows** (*Salix* species)

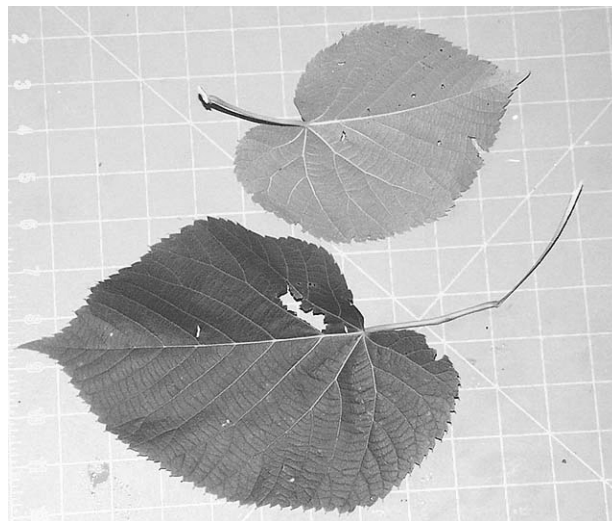
9. Leaf blades less than 3 times as long as broad

12. Petioles cylindrical

13. Leaf base unsymmetrical or oblique; first pair of lateral veins approaching midvein in size so that leaf is palmately veined at base

14. Leaf blade narrow with a long, drawn-out tip; ratio of leaf blade length to width greater than 1.5; bark of trunk stucco-like, with warty growths and ridges.....**Hackberry** (*Celtis occidentalis*)

14. Leaves broadly heart-shaped; ratio of leaf blade length to width less than 1.5; bark not warty.....**Basswood** (*Tilia americana*)



Basswood

- 13. Leaf base symmetrical; leaves pinnately veined
  - 15. Petioles without glands; buds resinous; bark greenish or light.....**Balsam poplar**  
(*Populus balsamifera*)
  - 15. Petioles with glands near blade; buds not resinous; bark dark red, brown, or black, often peeling horizontally
    - 17. Branches unarmed; fruits in racemes; tree up to 25 m tall.....**Wild black cherry**  
(*Prunus serotina*)
    - 17. Branches thorny; fruits in clusters of 1-3; small tree or shrub up to 8 m tall  
.....**Wild plum**  
(*Prunus americana*)

12 Petioles vertically flattened

- 18. Leaves white-wooly beneath.....**White poplar**  
(*Populus alba*)
- 18. Leaves not white-wooly beneath
  - 19. Leaves egg-shaped, round, or elliptical in overall outline, tending to have rounded margins
    - 20. Leaves finely toothed, with 20-40 teeth per side.....**Trembling aspen**  
(*Populus tremuloides*)
    - 20. Leaves coarsely toothed, with 5-15 teeth per side.....**Large-toothed aspen**  
(*Populus grandidentata*)
  - 19. Leaves triangular or rhombic in overall outline, tending to have straight margins
    - 21. Mature blades of short branches (not sprouts) 6-12 cm broad, with basal glands..... **Cottonwood**  
(*Populus deltoides*)

21. Mature blades 3-8 cm broad, without basal glands.....**Lombardy poplar**  
(*Populus nigra*)

8. Leaves doubly toothed, with larger teeth bearing smaller teeth

22. Leaf base not symmetrical

23. Cross-section of bark with alternate layers colored cream and brown; leaves often smooth above.....**American elm**  
(*Ulmus americana*)

23. Cross-section of bark uniformly brown; leaves like sandpaper above.....**Slippery elm**  
(*Ulmus rubra*)

22. Leaf base symmetrical

24. Branches with spurs (short, stubby shoots bearing a cluster of leaves); bark often peeling off in rolls

25. Bark white; twigs without winter- green flavor; leaves mostly with less than 8 pairs of veins.....**White birch**  
(*Betula papyrifera*)

25. Bark dirty yellow; twigs with winter-green flavor; leaves with more than 8 pairs of veins.....**Yellow birch**  
(*Betula allegheniensis*)

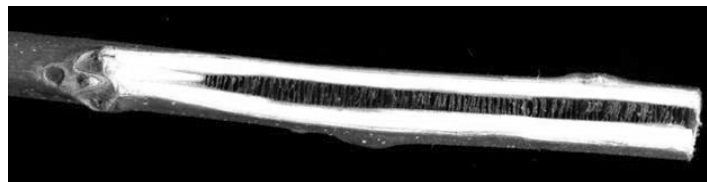
24. Branches without spurs; bark scaly  
.....**Hop hornbeam**  
(*Ostrya virginiana*)



Hop hornbeam

**Key V. Trees with alternate, compound leaves.**

1. Some or all leaves twice compound
  2. Leaflet margin without teeth; thorns absent.....**Kentucky coffee tree**  
(*Gymnocladus dioica*)
  2. Leaflet margin with teeth; stout thorns usually present on trunk.....**Honey locust**  
(*Gleditsia triacanthos*)
1. Leaves once compound
  3. Lateral buds hidden beneath base of petiole
    4. Leaflet margin without teeth; node usually with a pair of spines.....**Black locust**  
(*Robinia pseudo-acacia*)
    4. Leaflet margin with teeth; twigs usually with simple or branched thorns.....**Honey locust**  
(*Gleditsia triacanthos*)
  3. Lateral buds evident, axillary
    5. Larger leaflets narrower than 3 cm; leaves not glandular-hairy; fruits berry-like .....**European mountain ash**  
(*Pyrus aucuparia*)
    5. Larger leaflets wider than 3 cm; leaves often glandular-hairy; fruit a nut
      6. Pith chambered; mostly more than 4 pairs of lateral leaflets (range: 3-8 pairs)
        7. Leaf-scars without hairy fringe along upper margin; end leaflet often absent; fruit round .....**Black walnut**  
(*Juglans nigra*)
        7. Leaf-scars with hairy fringe along upper margin; end leaflet usually present; fruit oblong .....**Butternut**  
(*Juglans cinerea*)



Chambered Pith

- 6. Pith continuous; mostly less than 4 pairs of lateral leaflets (range: 2-4 pairs)
  - 8. Bud-scales yellow, not overlapping, mostly 3 pairs of lateral leaflets.....**Bitternut Hickory**  
(*Carya cordiformis*)
  - 8. Bud-scales brown, overlapping, mostly 2 pairs of lateral leaflets.....**Shagbark Hickory**  
(*Carya ovata*)



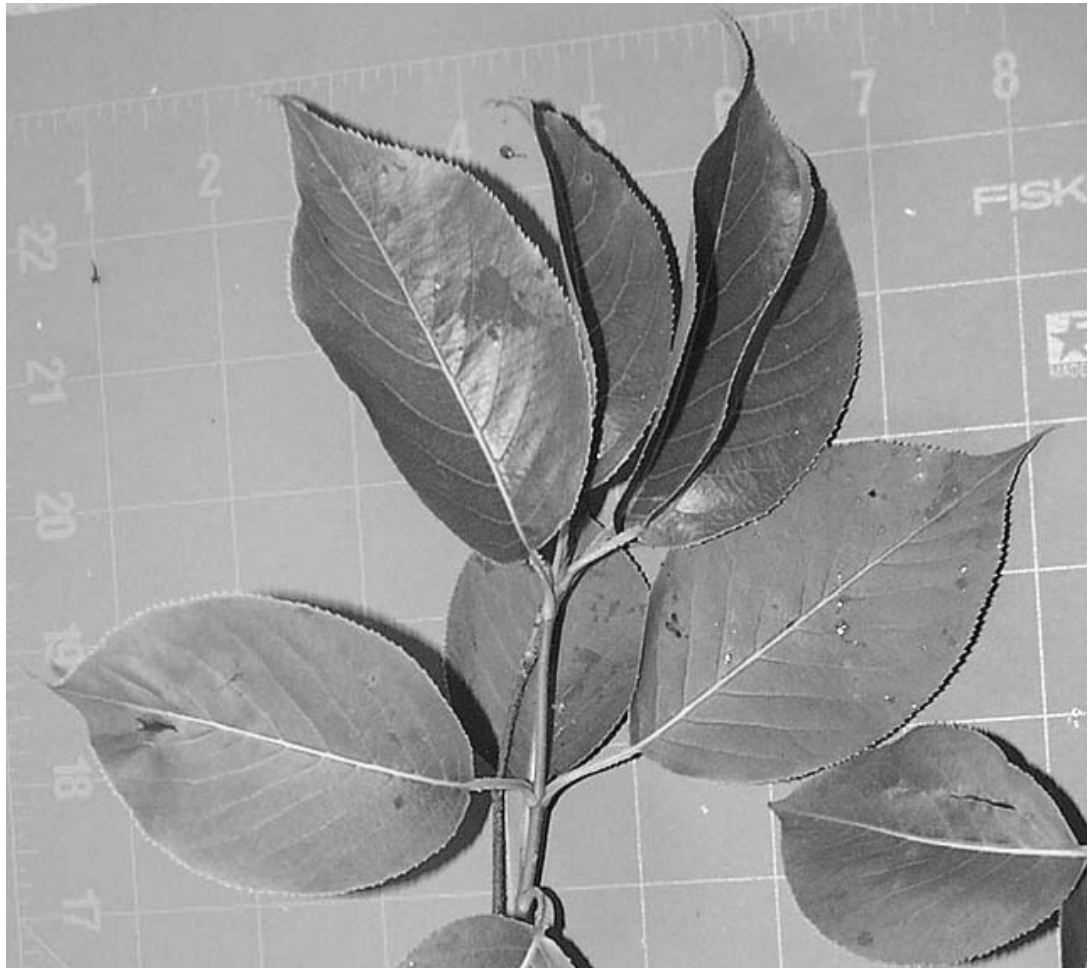
*C. ovata* on the left  
*C. cordiformis* on the right

**Key VI. Shrubs or vines with opposite or whorled leaves.**

- 1. Leaves palmately compound.....**Bottlebrush Buckeye**  
(*Aesculus parviflora*)
  
- 1. Leaves pinnately compound
  - 2. Pith white.....**Common elder**  
(*Sambucus canadensis*)
  
  - 2. Pith orange.....**Red-berried elder**  
(*Sambucus racemosa* ssp. *pubeus*)
  
- 1. Leaves simple
  - 3. Leaves palmately lobed
    - 4. Petioles with stipules near stem and glands near base of blade; fruit a drupe.....**Cranberry-bush**  
(*Viburnum opulus*)
  
    - 4. Petioles without stipules and glands; fruit a samara.....**Siberian maple**  
(*Acer ginnala*)
  
  - 3. Leaves not lobed
    - 5. Leaf margin entire
      - 6. Leaves ovate, with cordate to truncate base and long-tapering tip.....**Common lilac**  
(*Syringa vulgaris*)
  
      - 6. Leaves rounded to acute at base and tip
        - 7. Leaves with lateral veins arching towards tip and running somewhat parallel with margin
          - 8. Leaves with 6-8 pairs of lateral veins; twigs streaked with purple.....**Round-leaved dogwood**  
(*Cornus rugosa*)
  
          - 8. Leaves mostly with fewer than 6 pairs of lateral veins; twigs not streaked

- 9. Branches purplish or red; inflorescence almost flat-topped.....**Red-osier dogwood**  
(*Cornus stolonifera*)
- 9. Branches gray; inflorescence elongate, with red pedicels.....**Gray dogwood**  
(*Cornus racemosa*)
- 7. Leaves with lateral veins ending near margin and not running toward apex
  - 10. Petiole bases of opposite leaves not joined by a transverse line; bark not peeling.....**Privet**  
(*Ligustrum species*)
  - 10. Petiole bases of opposite leaves joined by a transverse line or meeting; bark on older branches peeling off in long, shreddy pieces
    - 11. Twining vine; pair of leaves subtending flowers joined at base .....**Smooth-leaved honeysuckle**  
(*Lonicera dioica*)
    - 11. Stout, upright shrub; no leaves joined at base .....**Tartarian honeysuckle**  
(*Lonicera tatarica* X *L. morrowii* complex)
- 5. Leaf margin toothed
  - 12. Petiole bases of opposite leaves joined by a transverse line or meeting
    - 13. Buds embedded under petiole base; not axillary; fruit a capsule.....**Mock-orange**  
(*Philadelphus sp.*)
    - 13. Buds not embedded, axillary
      - 14. Mostly shorter than 1 m; with hairy ridge running down from transverse line connecting petiole bases; fruit a capsule.....**Bush honeysuckle**  
(*Diervilla lonicera*)

14. Mostly taller than 1 m; without ridge; fruit a drupe.....**Nannyberry (*Viburnum lentago*)**
12. Petiole bases of opposite leaves not joined by a distinct transverse line, not meeting
15. Evergreen, trailing or climbing shrub; unarmed; fruit a capsule enclosing seeds with a fleshy, orange coat  
.....**Wintercreeper (*Euonymous fortunei*)**
15. Deciduous, upright shrub; some twigs ending in spines; fruit a black berry.....**Buckthorn (*Rhamnus cathartica*)**



*Viburnum lentago*



**Key VII. Shrubs or vines with alternate simple leaves.**

**1. Leaves lobed**

**2. Vines**

**3. Tendrils present**

4. Tendrils without adhesive pads. Leaves with three or five lobes

.....**Riverbank grape**  
**(*Vitis riparia*)**

4. Tendrils with adhesive pads. Leaves with three lobes

.....**Boston Ivy**  
**(*Parthenocissus tricuspidata*)**

**3. Tendrils absent.....Moonseed**

**(*Menispermum canadense*)**

**2. Erect shrubs**

**5. Older bark separating in numerous thin layers; fruit an inflated capsule.....Ninebark**

**(*Physocarpus opulifolius*)**

**5. Older bark tight; fruit a berry**

**6. Leaves with minute, yellow dots on both surfaces; wild.....Wild black currant**

**(*Ribes americanum*)**

**6. Leaves without such dots;**

**cultivated.....Mountain currant**  
**(*Ribes alpinum*)**

**1. Leaves not lobed**

**7. Stems with spines**

**8. Spines at nodes; leaves entire.....Japanese barberry**

**(*Berberis thunbergii*)**

**8. Thorn at end of most twigs; leaves**

**toothed.....Buckthorn**

**(*Rhamnus cathartica*)**

**7. Stems unarmed**

**9. Vines.....American bittersweet**

**(*Celastrus scandens*)**

**9. Erect shrubs**

**10. Leaf margin entire. ....Alternate-leaved dogwood**

**(*Cornus alternifolia*)**

10. Leaf margin toothed

11. Each bud covered by a single hood-like scale

.....**Willow**  
(*Salix* species)

11. Each bud covered by 2 or more scales

12. Twigs and petioles with coarse, gland-tipped hairs standing perpendicular to surface; fruit a nut.....**American hazelnut**  
(*Corylus americana*)

12. Twigs and petioles without such hairs; fruit fleshy or capsule-like

13. Petioles with one or more glands near upper end.....**Chokecherry**  
(*Prunus virginiana*)

13. Petioles without glands

14. Base of leaf wedge-shaped; fruit dry, like a capsule.....**Bridal wreath**  
(*Spiraea X vanhouttei*)

14. Base of leaf rounded or heart-shaped; fruit fleshy, like a berry.....**Shadbush**  
(*Amelanchier* species)



*Spiraea X vanhouttei*

**Key VIII. Shrubs or vines with alternate, compound leaves.**

**1. Plants with spines, thorns, or bristles**

- 2. Stipules absent; crushed leaves and bark with aromatic fragrance.....**Prickly ash**  
(*Zanthoxylum americanum*)
- 2. Stipules present; plant not aromatic
  - 3. Leaves green beneath; leaf margin evenly toothed; stipules conspicuous and fused with petiole for over half their length.....**Rose**  
(*Rosa sp.*)
  - 3. Leaves white beneath; leaf margin coarsely, often doubly toothed; stipules inconspicuous, not strongly fused with petiole
    - 4. Stems erect, covered with bristly hairs; fruit red.....**Red raspberry**  
(*Rubus idaeus*)
    - 4. Stems arching, often rooting at tips, covered with stout-based prickles; fruit black.....**Black raspberry**  
(*Rubus occidentalis*)

**1. Plants unarmed**

- 5. Leaves palmately compound with more than 3 leaflets; vines with tendrils.....**Virginia creeper**  
(*Parthenocissus quinquefolia*)
- 5. Leaves pinnately compound or with 3 leaflets; shrubs or vines without tendrils
  - 6. Leaves with 3 leaflets; fruits white; causes dermatitis.....**Poison ivy**  
(*Toxicodendron radicans*)
  - 6. Leaves with more than 3 leaflets; fruits red; not poisonous
    - 7. Leaves and twigs hairy.....**Staghorn sumac**  
(*Rhus typhina*)
    - 7. Leaves and twigs glabrous.....**Smooth sumac**  
(*Rhus glabra*)



Poison Ivy

## GLOSSARY

Compiled by Allen Prunty, fall, 1978

- achene.** A dry indehiscent fruit with thin pericarp fitting closely around seed.
- acuminate.** Long-tapering to a pointed apex or base.
- acute.** Sharp-pointed
- alternate.** Describing the arrangement of leaves or other structures which occur singly at successive nodes or levels; not opposite or whorled.
- awl-shaped.** Tapering from a narrow base to a point.
- axil.** Angle formed by one structure with another, as a leaf with a stem.
- axillary.** In the axil.
- berry.** A fruit with a fleshy pericarp.
- bipinnate.** Twice pinnately compound.
- blade.** The expanded, more or less flat portion of a leaf.
- cordate.** Heart-shaped.
- deciduous.** Descriptive of a plant whose leaves fall off at the end of one growing season.
- dehiscent.** Splitting open, usually in some regular way.
- diaphragmed (pith).** With transverse partitions or plates.
- dichotomous.** Two forked.
- dioecious.** Descriptive of a species having female and male flowers on separate plants.
- drupe.** An indehiscent fruit with outer portion of pericarp fleshy and inner portion of pericarp stony (e.g., cherry).

**entire** (margin). Unbroken by indentations.

**evergreen.** With green leaves throughout the year.

**glabrate.** Becoming glabrous with age; nearly glabrous.

**glabrous.** Without hairs.

**indehiscent.** Not opening.

**internode.** Region of stem between two nodes.

**lanceolate.** Lance-shaped; widest above base, tapering to apex, several times as long as wide.

**lateral.** On side (side branches or buds, veins to the side of the midvein).

**leaflet.** One of the divisions of the blade of a compound leaf.

**legume.** A dry fruit of one carpel dehiscent along a suture and midrib (e.g., pea).

**lobed.** Separated by indentations (sinuses) into segments (lobes) larger than teeth.

**midrib.** Midvein.

**monoecious.** Descriptive of a species having separate female and male flowers on same plant.

**node.** Short zone of stem where leaf or leaves are borne.

**nut.** A hard indehiscent one-seeded fruit (e.g., acorn).

**ob-** Prefix meaning in an opposite direction; thus obovate is inversely ovate.

**oblique.** With unequal sides; not at right angles to; slanting.

**oblong.** Longer than wide, the sides nearly or quite parallel and ends rounded.

**obtuse.** Blunt.

**opposite.** Two at a node or at same level of an axis or rachis.

**oval.** Broadly elliptic.

**ovate.** Having the shape of a median longitudinal section through an egg, with widest portion below the middle.

**ovoid.** Egg-shaped.

**palmately compound.** With leaflets all arising at apex of petiole.

**palmately veined.** With principal veins diverging from top of petiole.

**pinnate** (leaf). Compound with leaflets along a rachis.

**pinnately compound.** Pinnate.

**pinnately veined.** With one main vein, the midvein, from which principal lateral veins branch.

**pubescent.** Hairy.

**raceme.** Elongate inflorescences with each flower on a pedicel.

**rachis.** Axis of a pinnately compound leaf; sometimes used, also, to mean the axis of an inflorescence.

**sinus.** Indentation between lobes or teeth.

**spur.** Short, stubby branches bearing a cluster of leaves.

**tendrils.** A slender coiling segment of a leaf or stem.

**thorn.** A sharp-pointed stem or branch of a stem.

**venation.** Arrangement of veins.

**whorl.** A group of 3 or more leaves or other structures at a node.

## Leaf Venation



Palmate



Pinnate



Parallel

## Leaf Margins



Entire



Toothed  
(once toothed)

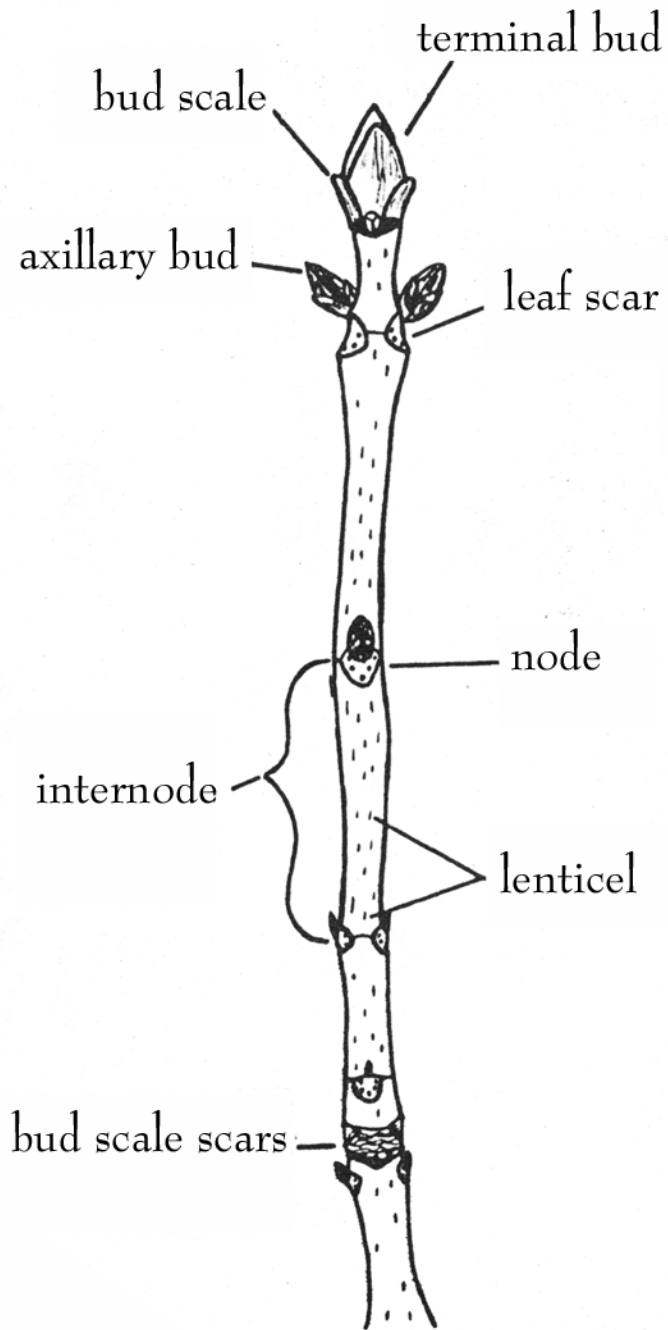


Doubly  
Toothed



Lobed

# Stems



## Pith Types

